Observations on 300 Consecutive Thyroidectomies

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The place for thyroidectomy in the treatment of disease of the thyroid gland is now well established. It has for long been practised by surgeons to relieve the pressure symptoms caused by simple non-toxic goitres, but it was not until the end of the first decade of this century that its use in the treatment of thyrotoxicosis was first described.

Mayo, in 1907, reported on 110 operations for thyrotoxicosis with nine deaths. Dunhill, in 1910, published a remarkable series of 199 operations for severe thyrotoxicosis with only three deaths. Up until after the First World War the majority of physicians in this country looked upon operation with disfavour, a view supported by the high mortality at that time.

From a study of the Royal Victoria Hospital records the earliest surgical procedure described in the treatment of thyrotoxicosis was carried out by Mr. Kirk. On 11th July, 1904 (i.e., in the first year of the Royal Victoria Hospital's existence on its present site), he operated on a young woman for serious exophthalmic goitre and tied the right inferior thyroid artery; six weeks later he tied both superior thyroid arteries, but no thyroid tissue was removed. One thyroidectomy for simple non-toxic goitre was performed in the same year by Mr. A. B. Mitchell. On the 23rd November, 1907, Mr. Robert Campbell performed what I believe was the first thyroidectomy for thyrotoxicosis. The operation performed was a partial right lobectomy, the patient a young woman with severe exophthalmus, a pulse rate of 110 and with so much loss of flesh that she weighed only five stones. She was discharged improved three weeks later.

In the year ending 31st December, 1954, 99 thyroidectomies are recorded by the surgeons of the Royal Victoria Hospital.

This paper is a review of 300 consecutive operations carried out by myself between 1st July, 1948, and 30th June, 1954. With the exception of 13 cases who could not be traced, all have been re-examined in the past few months, representing a follow-up of 96 per cent.

Selection of Cases for Operation.

Of all the patients with disease of the thyroid presenting at hospital, I have estimated that surgery will be recommended in two-thirds. The figure given at the New End Goitre Clinic in London is 60 per cent. If, then, the surgeon is to play such a major rôle in the management of these cases, he ought to see them either

separately or in joint consultation with his medical colleagues when the patients first come to hospital. Much has to be decided at this first interview and a treatment plan adopted which, in the light of modern knowledge, offers the best chance of success and safety for the patient. Is the goitre simple, toxic, malignant or otherwise? If toxic, the age and sex of the patient, the site of the goitre, the presence or absence of nodularity, the severity of the presenting symptoms, the presence or absence of auricular fibrillation or exophthalmos, all influence the line of attack taken in treatment. Too often the surgeon only sees the case after a long course of medical treatment, where relapse has taken place or the patient failed to respond or where some complications have set in during treatment.

Classification.

A satisfactory classification of disease of the thyroid gland on ætiological, pathological or clinical grounds is difficult to devise, and for the purpose of this paper I have merely grouped the 300 cases as follows :—

Simple non-toxic nodular goitre	97
Toxic primary and secondary goitre	180
Malignant goitre	12
Chronic thyroiditis	11
Total	300

There is no case of simple diffuse non-toxic goitre in the series as thyroidectomy is not recommended in these patients. Of these probably 50 per cent. will resolve with or without iodine treatment; the rest will eventually either become nodular or toxic and so fall into one of the aforementioned groups.

Simple Non-Toxic Nodular Goitre.

In this group there were 97 cases, i.e., roughly one-third of the series; 88 were females and 9 males—a ratio of roughly 10 females to 1 male. Their ages ranged from 19 to 73.

I have not advocated surgery in every simple nodular goitre, but I would say this, that there is less risk for the patient in undergoing operation than in keeping the goitre.

These cases present with a wide variety of symptoms; most want to know whether the lump in the neck is dangerous; others are distressed because of sudden increase in size of the swelling or by symptoms arising from pressure in the narrow thoracic inlet with cough, choking, lump in the throat, breathlessness, dyspnœa on exertion, change in voice; some are distressed only by the disfiguring swelling.

Malignant Change in Simple Nodular Goitre.

That malignant change in a simple goitre is anything but rare has been emphasised mainly by American authors. Cole, Slaughter and Rossiter (1944) reviewed 192 cases of non-toxic nodular goitre: 17.2 per cent. of the total were carcinomata; 11 per cent. of the multinodular cases and 24 per cent. of the solitary nodules were malignant.

INCIDENCE OF CARCINOMA IN NODULAR GOITRES.

(a) Cole, Slaughter and Rossiter—
Of 192 nodular goitres - - - 17.2 per cent. cancers.
Of 100 multinodular goitres - - 11.0 per cent. cancers.
Of 92 solitary nodules - - - 24.0 per cent. cancers.

(b) Present series—
Of 109 nodular goitres - - - 11.0 per cent. cancers.
Of 52 multinodular goitres - - 5.8 per cent. cancers.
Of 57 unilateral nodular - - 15.8 per cent. cancers.

In my experience single nodules in the thyroid are a rare finding either clinically or at operation. Unilateral nodularity, however, is common, and 48 of this series, i.e., 50 per cent., showed unilateral nodularity. Substituting unilateral nodularity for the American authors' single nodule, my own figures bear out the present teaching that a single nodule in the thyroid must be treated as a pre-malignant condition. Lahey has also emphasised this fact and states that neither age of the patient nor size of the goitre seems to matter.

Toxic Change in Simple Nodular Goitre.

It is difficult to foretell whether a simple goitre will become toxic. Wetherell (1941) has looked into this question very thoroughly and has estimated that 50 per cent. of patients with non-toxic nodular goitre will ultimately become toxic if left untreated, and this is the view held at most thyroid clinics in this country. Linnell, Keynes and Piercy (1946) suggest that goitres at middle life without toxic manifestations are rare. Symptoms of toxicity develop so insidiously in these cases that the patients delay consulting their doctor; again, the doctor often fails to recognise the milder symptoms and signs of thyrotoxicosis, with the result that damage to the cardio-vascular system may have occurred before proper treatment is instituted.

Next to acute rheumatism, thyrotoxicosis is the most fruitful cause of auricular fibrillation so that early detection, or better still, steps taken to prevent the onset of thyrotoxicosis, is recommended.

Hæmorrhage into the Gland.

Hæmorrhage into the substance of a goitre is not uncommon. In two cases the sudden increase in size warranted immediate admission to hospital. Acute severe hæmorrhage into a cyst is reported as rare. Details of one case in this series is worth recording.

A male, aged 35, with a five-year history of goitre, was admitted because of sudden increase in size of the lump, local pain, and dyspnœa. On examination, his breathing was obviously distressed and he was cyanosed, the thyroid was tense and painful to touch, the trachea deviated to the left, and on X-ray grossly narrowed. His condition demanded an emergency operation, at which a large cyst, filled with recent hæmorrhage, was found.

Pressure Symptoms.

It has been my practice to have the vocal cords of all goitre cases examined prior to and after operation. In this non-toxic, non-maligant group no less than

five patients, i.e., 5 per cent., were found to have unilateral recurrent laryngeal nerve paralysis. Cough and hoarseness of variable degree were common in all, and in each case the goitre was partially intra-thoracic, with deviation and narrowing of the trachea. Recovery of the nerve did not occur in any case following operation, and in none of these five cases was there any suspicion of malignancy on pathological examination.

Dysphagia and Dyspnœa.

Dysphagia is a rare symptom of thyroid disease except in malignancy. It was distressing in one of these simple cases.

Dyspnœa on exertion with cyanosis was seen in three cases; one young woman subject to fainting attacks was relieved by removing a large partially intra-tracheal goitre.

In 23 cases the gland was partially intra-thoracic.

Eight cases showed calcification of the gland on X-ray examination. Clinically, it is difficult to differentiate these from malignant disease, but none of these cases showed any malignant change pathologically.

Toxic Cases.

In the diagnosis of thyrotoxicosis most value is placed on a careful clinical examination. B.M.R. and blood cholestrol estimations are unnecessary in the obvious case and of little value in the doubtful. A therapeutic trial with thiouracil is sometimes helpful. Studies with radio-active iodine, its uptake in the gland, its rate of excretion in the urine, etc., offer a more accurate measure for the future.

In this series there were 180 cases of thyrotoxicosis, 165 females and 15 males—a ratio of 11 females to 1 male, roughly the same as in the non-toxic group. Their ages ranged from 18 to 70 years.

Fifty-three patients or 30 per cent. of the thyrotoxic cases had had a goitre for a variable number of years prior to the onset of symptoms—so called secondary toxic goitre. In these the onset of toxic symptoms is often insidious, and its presence may for a long time escape the notice of the doctor. Myocardial damage is therefore not uncommon, and 70 per cent. of the cases with auricular fibrillation fell into this group.

One is reluctant to diagnose thyrotoxicosis in the absence of goitre, yet three cases with undoubted toxicity had no clinical enlargement of the gland. The findings at operation often reveal a gland many times larger than clinically suspected, particularly in the patient with a short thick neck.

Toxic Symptoms.

In 93 patients the symptoms were severe. Auricular fibrillation was present in 36 cases, or 21 per cent. of the toxic group. All but five of these patients quickly reverted to normal cardiac rhythm following operation. The five in which auricular fibrillation persists gave histories of symptoms of 5-12 years' duration, and I suggest that in these, irreversible cardiac damage was established before thyroidectomy. Early surgery is, therefore, recommended in these toxic nodular cases.

Exophthalmos was present in 65 cases, or 30 per cent. of the series. Two of these cases were unilateral. In most cases the eye signs have improved one month after operation, and in all cases, no matter how severe the symptoms, the eyes have improved on their pre-operative condition one year following operation.

All the male patients had severe symptoms. Ten of the 15 suffered from auricular fibrillation and all but 4 had exophthalmos. Loss of weight was also a marked feature, one man losing 8½ stone in six months. The thyrotoxicosis in these male patients was more difficult to control than in the females.

One patient was 17 weeks pregnant at the time of operation. Convalescence was uneventful, and she gave rise to no anxiety as regards her pregnancy.

Treatment.

Up until the introduction of radio-active iodine, most goitres with thyrotoxicosis have been recommended for surgical treatment. I believe that a fair trial of medical treatment ought to be offered to those young female patients with a short history, moderate toxicity and a small smooth gland. Thyroidectomy is essential in the toxic nodular goitre in all male patients and all patients suffering from valvular heart disease.

Thiouracil and more recently 'neo mercazole' and iodine are extremely useful in preparing these patients for operation, but with medical treatment alone the relapse rate is too high (probably not less than 65 per cent.) and complications such as leucopenia, agranulocytosis, skin rash, nausea and lymphadenopathy are not uncommon.

Although many of the goitres become smaller, the majority are enlarged and, if intra-thoracic, disturbing obstructive symptoms are induced; besides, treatment is prolonged and careful supervision absolutely essential.

It is well known that agranulocytosis may set in at any time in the course of thiouracil treatment. In two cases in this series, one was diagnosed one week after the commencement of treatment; in the second only after a second course was instituted following a relapse of symptoms. As well as these two cases, thiouracil therapy was stopped in 6 cases with leucopenia; 3 with nausea and vomiting; in 4 who developed an erythematous rash and 11 cases where the goitre was intra-thoracic with disturbing pressure symptoms. The thiouracil leads to increased vascularity and friability in the gland and makes the operation more difficult for the surgeon. Preparation with iodine alone is therefore recommended in the mild toxic cases.

Previous Treatment.

One patient had had deep X-ray therapy at the age of 18 for thyrotoxicosis with apparently good result, but relapsed twenty years later; another was treated with a radium collar with similar result; six had had previous operations, and in two cases two operations had been performed.

Chronic Thyroiditis.

This group of 11 patients included 9 reported on by the pathologist as lymphadenoid goitre and two as Riedl's thyroiditis. All were females, the average age being 45 years, the youngest 31; only three were over 50 years.

Surgical treatment is generally only advised in chronic thyroiditis when the goitre is giving rise to pressure symptoms, but as many are associated with thyrotoxicosis in the early stages, others because the very firm nature of the goitre may closely simulate malignant disease, operation is often performed because of mistaken diagnosis.

Presenting Symptoms.

One patient, aged 31, had a three-year history of goitre with typical toxic symptoms. She was treated with thiouracil and submitted to subtotal thyroidectomy. Two cases presented with mild toxic symptoms; in three a pre-operative diagnosis of cancer was made, and four presented with simple goitre with a recent history of increase in size of the gland. In only one case was there myxœdema. Her story is worth recording because of the rapid onset of symptoms.

> Mrs. M., aged 40, admitted to hospital on 8th June, 1954, was perfectly well until six weeks before admission, when she had an influenza-like illness associated with a sudden and somewhat painful enlargement of the thyroid gland. On admission she was obviously myxœdematous. Her hair and skin had become dry, her voice thick and swallowing difficult. On examination the thyroid gland was uniformly enlarged and very firm; the B.M.R. was −20, and her vocal cords were œdematous. The histological appearances resembled Riedl's struma rather than lymphadenoid goitre.

All these patients are well and leading perfectly normal lives on replacement therapy. Of the 3 presenting with toxic symptoms, 2 have not as yet developed signs of hypothyroidism, but it is only twelve and nine months respectively since their operations.

The ætiology of chronic thyroiditis is not as yet understood. Much has been written about the relation between lymphadenoid goitre and Riedl's struma. Many authors claim that they are separate entities with separate clinical and pathological findings, a view for which I find no support in practice; others that Riedl's struma is merely the late manifestation of the other. But surely if this were so, then we ought to see at least as many cases of Riedl's struma as lymphadenoid goitre, but in actual fact the former is a rare condition in most centres. My own feeling is that the precipitating factor, whatever it may be, is the same in both, but that the local reaction differs; in some the lymphoid infiltration predominates; in others there is mainly fibrous tissue replacement, the clinical picture depending on the extent of the degenerative changes present in the epithelial elements.

Malignant Cases.

Of the malignant cases seen during the period under review, 12 were submitted to operation; of these 10 were females and 2 males, a ratio of 5 : 1 compared with 10 : 1 in the non-malignant series. The average age was 54, the youngest 24, and the oldest 73.

Nine of these malignant tumours arose in a pre-existing goitre and 3 de novo; 8 were anaplastic adeno-carcinoma; 4 were papillary adeno-carcinoma. From a study of the clinical history, clinical and operation findings, it is suggested that

at least 8 of these, i.e., 67 per cent., had their origin in a single nodule. This adds strength to what I have already said about the potential dangers of a single nodule in the thyroid gland.

Diagnosis.

The diagnosis was clinically obvious in 9, made at operation in 2 cases, and in 1 by the pathologist. Regrettably, modern standard textbooks of surgery still state that carcinoma of the thyroid is a rare disease; diagnosis is, therefore, often delayed because the doctor or consultant fails to consider the thyroid as potentially dangerous. In 4 cases, i.e., one-third of the total with clinically obvious carcinoma of the thyroid, the diagnosis was missed until special investigations, e.g., in 3 cases biopsy of cervical gland; in another X-ray chest suggested the correct diagnosis. One patient was treated for pleurisy for one year; 2 were thought to have tuberculous glands of neck; 1 was considered thyrotoxic, the B.M.R. in this case being +22.

Unfortunately it is only too true to say that carcinoma of the thyroid, advanced far enough to give rise to symptoms, is often beyond hope of cure.

Treatment.

Radical surgery, if feasible, is still the best treatment for malignant goitre.

Operation to-day has a dual purpose. In the first instance, an attempt is made to completely eradicate the disease, and this may necessitate unilateral or bilateral radical dissection of the gland of the neck. In the second, both malignant and normal thyroid tissue is removed so that the remaining maligant cells, whether local or distal, may be encouraged to take up radio-active iodine and so help to effect a cure.

Survival.

Of the 8 anaplastic tumours, none survived twelve months after operation; only 1 was benefited, and that temporarily by deep X-ray therapy, and of the 2 cases sent for radio-active iodine, neither would take up the iodine. Of the papillary adeno-carcinoma cases, 2 are alive and well, 4 and 2 years respectively after operation. In both of these there was no apparent spread outside the gland at operation; in the third the tumour had already spread to glands which could only be partially removed. This patient is alive, eighteen months following operation, but with secondaries in the lungs and mediastinal glands, and is being treated with radio-active iodine.

Papillary adeno-carcinoma of the thyroid is, as a rule, a slowly growing tumour, usually metastasing to glands locally and often curable by radical surgery. Details of the fourth case are worth recording.

> A female, aged 48, had in December, 1945, a partial lobectomy performed elsewhere for an apparently simple nodular goitre. Six months later she noticed a small lump in the scar, and when she presented herself at the "Royal" three and a half years after the first operation the lump was 2 cms. in diameter and in the skin of the scar, the thyroid itself was obviously malignant. The pathologist reported on the gland and skin nodule as papillary adeno-carcinoma.

The original thyroid tissue was not submitted for pathological examination, but one must assume that it was already the seat of a carcinoma and at operation a malignant seedling had been planted in the wound.

I need not stress the value of submitting all operation specimens for pathological examination, no matter how simple they appear to be. This patient's life could have been saved, as the tumour was obviously of low malignancy and amenable to surgery. The occurrence of a secondary nodule in the scar is of considerable interest.

The Operation.

The operation was described in detail and illustrated with slides. The technique adopted is very much the same as that described by Piercey (1950). A radical subtotal resection, including the pyramidal lobe, is advocated in the toxic cases, and the importance of tying both inferior thyroid arteries in the prevention of recurrence is stressed.

In all nodular cases it is recommended that the gland once removed should be immediately sectioned by the surgeon. By doing so routinely, in two cases I have been able to diagnose carcinoma of the thyroid at this stage and proceed immediately to a more radical operation. Drainage of the wound is only carried out where there is any doubt about the hæmostasis and where a very large 'dead space' exists after removing the thyroid. This was necessary in 10 per cent. of the series.

Complications of Operation.

A few patients complain of some hoarseness and sore throat, with difficulty in swallowing, for the first 24-48 hours, but as a rule a full diet is enjoyed and the patient allowed out of bed the day following operation. Painful throat is commoner in those in whom the infra thyroid muscles have been divided and repaired.

Effusion under the Skin Flaps.

By far the commonest complication was a sero-sanginous effusion underneath the skin flaps. This is usually noticed a few days after operation and is not a serious condition, but early recognition and adequate treatment is advocated, for, if neglected, the wound may break down, secondary infection occur, and a broad adherent scar result. The fluid may be aspirated by pushing a needle through the skin of the lower flap or through the lateral aspect of the wound and applying a pressure bandage.

Hæmorrhage.

Distressing hæmorrhage occurred in two cases, and in each the symptoms came on suddenly after a bout of vomiting eight and twenty hours respectively after operation, suggesting that a ligature, probably on a vein, had been "blown off." The onset of swelling in the neck with stridor and cyanosis was quickly recognised by the nursing staff. Both patients were taken to the theatre, all clips removed, and under local anæsthetic the wound laid wide open, the blood clot evacuated, and the wound lightly packed with sterile gauze and left open. Secondary suture

was carried out in twenty-four hours. Neither of these cases was considered an acute emergency, but if such did occur, the treatment outlined could well be carried out in the ward without anæsthesia by the house surgeon.

Infection.

Acute pyogenic infection occurred in one patient, causing local pain and high fever, and in spite of vigorous treatment with penicillin and streptomycin, the wound had to be opened and drained, and an ugly adherent scar resulted. In six cases mild infection in one or two of the catgut sutures in the platysma muscle resulted in small localised subcutaneous abscesses, which either burst through the scar discharging the catgut or when recognised were incised. These cases occurred usually after the patient left hospital, the six-day catgut used was sterilised locally, and since we have given up this practice no such cases have been seen.

Tetany.

There were seven cases of tetany. In six of these the symptoms were transient, coming on forty-eight hours after operation and lasting for a few days, and were easily controlled with calcium gluconate. In these cases the blood supply to the parathyroid glands, which come from the anastamosing channels between the superior and inferior thyroid vessels, is temporarily embarrassed after tying these vessels. One lady who had a subtotal thyroidectomy for nodular toxic goitre is still on treatment nine months after her operation. At operation both superior and inferior thyroid arteries were tied, and I can only presume that all the parathyroid tissue was removed or its blood supply permanently damaged. She may have had only one or two parathyroid glands or they may have been abnormally situated. Heinbach (1933) suggests that the common textbook teaching that "there are two pairs of parathyroid glands, superior and inferior, and with a typical location" is misleading. He made a special study of 25 human bodies and found 86 parathyroid glands, i.e., an average of 3.2 per specimen, and in a review of the subject he states that no investigator in this field has found four parathyroid glands per person in more than 50 per cent. of specimens.

Recurrent Laryngeal Nerve Paralysis.

There were three cases of permanent damage to the recurrent laryngeal nerve and in each the lesion was unilateral. In the first case, the nerve was divided in attempting a complete thyroidectomy for cancer. The second case had already undergone elsewhere two operations for thyrotoxicosis. At operation on the third case, the left lobe of the thyroid was very nodular and its lower pole extended into the thorax as far as the arch of the aorta, and in mobilising this infra-thoracic portion, the nerve must have been damaged deep in the thorax. In straightforward uncomplicated cases, I believe that this complication should occur but rarely.

Hypothyroidism.

Apart from those cases of chronic thydroiditis in which one naturally expects hypothyroidism to develop, hypothyroidism has developed in four cases following on subtotal thyroidectomy for non-toxic nodular goitre. In these cases, both superior and inferior thyroid arteries were ligatured. It is suggested that one

inferior thyroid artery should be left intact in non-toxic cases to ensure an adequate blood supply to the remnant and to the parathyroid gland, and so avoid the possibility of hypothyroidism and tetany. These patients are maintained on dry extract of thyroid and suffer no disability as the result of this complication.

Aggravation of the Exophthalmos.

Of the 63 cases of exophthalmos, the eye symptoms and signs were slightly worse in three in the immediate post-operative period. There was no case of corneal ulceration; one developed diplopia, but in none did the symptoms or signs warrant a decompression operation of the Nephzieger type. These cases appear to go on improving for a year to eighteen months after operation and many then remain stationary, suggesting irreversible changes in the peri-ocular tissues. It is very difficult to tell in what cases operation is likely to aggravate the exophthalmos. Generally speaking, if there is rapid onset of the condition with tense and painful eyeballs, operation should be withheld. I have not as yet denied any patient the benefit of operation because of this fear of ophthalmoplegia.

It is claimed by those who have had experience with radio-active iodine that malignant exophthalmos is less likely to develop using this method of treatment. My only experience in this field is of one patient with severe exophthalmos, who had two operations for thyrotoxicosis and recurred. She was referred for radio-active iodine with alleviation of her symptoms and marked improvement in the eyes.

Recurrence of Toxicity.

The follow-up in this series is, of course, far too short to be of any value in this respect. Two cases have so far recurred; each has had two operations, the primary operation being performed elsewhere. I have attributed the recurrence in these to failure to tie both inferior thyroid arteries, a point which Piercey has emphasised in lowering the recurrence rate following operation. Both of these cases have been successfully treated with radio-active iodine.

Mortality.

One patient died six hours post-operatively, a mortaltiy of 0.3 per cent. The patient had moderately severe thyrotoxicosis. She had been treated medically in hospital the year before, but relapsed and was readmitted and prepared in the usual way for surgery. No pre-operative cardiac lesion was noted. At operation the gland was uniformly enlarged, firm and vascular, and a subtotal thyroidectomy carried out without difficulty. She was seen at 7.30 the same evening, sitting up in bed and apparently perfectly well. Her husband visited her and left her bedside at 9 p.m. She died suddenly some ten minutes later. No post-mortem was allowed, but I was able to open the wound and found no local cause for the sudden death.

Results.

Apart from the malignant cases where we can only claim a 16 per cent. cure rate, the results in the toxic and non-toxic cases are very satisfactory. Over 97 per cent. of these patients are living normal useful lives.

Radio-Active Iodine.

Radio-active iodine has been mentioned in the diagnosis and treatment of thyrotoxicosis and in the treatment of thyroid cancer. It is advised in thyrotoxic cases with recurrence of symptoms following operation, particularly if a recurrent laryngeal nerve has been damaged; in cases unfit for major surgery; and in those refusing operation. In the treatment of thyroid cancer, the results have been very disappointing, as only a very small percentage of cases can be made to take up the iodine.

Summary.

1. Three hundred consecutive thyroidectomies are reviewed, and a mortality of 0.3 per cent. reported.
2. Operation in simple nodular goitre is recommended because of the danger of malignant change, the onset of toxic and pressure symptoms, hæmorrhage into the goitre, and recurrent laryngeal nerve paralysis.
3. Operation is advised in most cases of primary thyrotoxicosis; it is essential and urgent in toxic nodular goitre, in male toxic patients, and in toxic patients with valvular heart disease. Toxic cases recurring after surgery and the very bad risk cases are selected for treatment with radio-active iodine.
4. Radical surgery offers the best results in the treatment of thyroid cancer. The results with deep X-ray therapy and radio-active iodine are disappointing.
5. The vocal cords should be examined in all cases before and after operation.
6. A radical operation in thyrotoxic cases is advised. The importance of tying both inferior thyroid arteries is stressed in preventing recurrence of symptoms following operation.
7. Immediate section at operation of all nodular goitres is recommended.

I am indebted to the physicians of the Royal Victoria Hospital for their help in the management of these cases; to the anæsthetists for their skilled anæsthesia; and to Mr. Kennedy Hunter for examination of the vocal cords. I am especially indebted to my old chief, Mr. R. J. McConnell, whose guidance and assistance in the early cases has been invaluable.

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